McKinsey Global Institute

November 2014

Southeast Asia at the crossroads: Three paths to prosperity

Executive summary

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IN BRIEF

Southeast Asia at the crossroads: Three paths to prosperity

The Association of Southeast Asian Nations (ASEAN) encompasses Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam—countries with a multitude of ethnicities and languages as well as wide economic disparities. But these nations are tied together by multiple threads of history and culture, and today they are increasingly linked by business networks, trade relationships, migration, and shared resources. Almost five decades after the organization's founding, ASEAN is pursuing more ambitious goals for integration.

Southeast Asia has enjoyed remarkable economic progress in recent years. Viewed as a single entity, the region would rank as the seventh-largest economy in the world. But much of its recent growth has been generated by an expanding labor force and the shift of workers from agriculture to manufacturing. These factors will eventually fade, which creates new urgency for confronting the region's low levels of productivity. To sustain economic growth, many member states will need to more than double their historic rates of productivity improvement.

Southeast Asia can address its productivity challenges and find new catalysts for growth by carving out its own unique opportunities from three global megatrends:

- **Capturing a greater share of global flows.** The global economy has become deeply interconnected as huge volumes of goods, services, capital, people, and data move across borders. Southeast Asia can capitalize on this phenomenon by accelerating implementation of the ASEAN Economic Community integration plan to create a single market of 600 million consumers. It can also take steps to build a more competitive manufacturing sector that could attract additional production from multinationals as labor costs rise in China. Together these opportunities could create some $280 billion to $615 billion in annual economic value by 2030.

- **Riding the urbanization wave.** The booming cities of Southeast Asia account for more than 65 percent of the region's GDP today, and more than 90 million people are expected to move to urban areas by 2030. This shift will support the continued growth of the "consuming class," which could double to 163 million households by 2030, making Southeast Asia a pivotal market of the future for companies in a range of industries. Keeping pace with this growth and creating cities with a high quality of life will demand some $7 trillion in investment in infrastructure, housing, and commercial space. By 2030, the continued growth of cities could add some $520 billion to $930 billion to the region's annual GDP.

- **Deploying disruptive technologies.** Five related technologies—the mobile Internet, big data, the Internet of Things, the automation of knowledge work, and cloud technology—could modernize sectors across the economy and drive major productivity improvements. Within many industries, large value is at stake for companies that move quickly to digitize. We estimate that disruptive technologies could produce $220 billion to $625 billion in annual economic impact for Southeast Asia by 2030, but the region will need to prioritize building out backbone infrastructure to capture this opportunity.

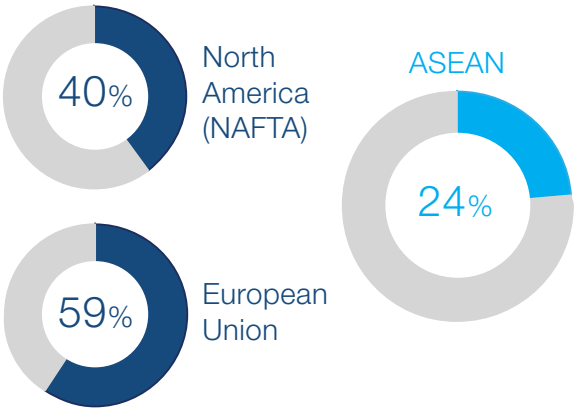
Global flows, urbanization, and technology are already reshaping the region. But if policy makers and businesses prioritize the opportunities associated with these trends, the results could be transformative. Southeast Asia could be poised to make major strides in economic development and to expand the possibilities for what integration can achieve.

Three global trends create opportunities to transform Southeast Asia by 2030

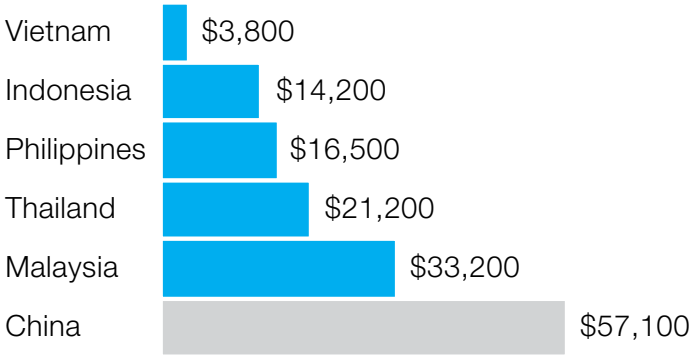
1 Capturing a greater share of global flows

Up to $615 billion in annual economic value

The ASEAN Economic Community (AEC) sets the stage for greater intraregional trade



To attract more global production, Southeast Asia must raise labor productivity

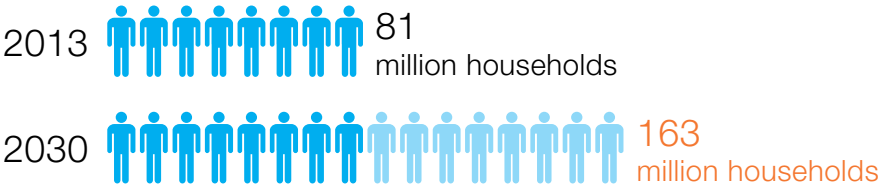


Annual manufacturing output per worker, 2012

2 Riding the urbanization wave

Up to $930 billion in annual economic value

An expanding consumer class



$7 trillion in investment needed for infrastructure, housing, and commercial space

3 Deploying disruptive technologies

Up to $625 billion in annual economic value

Mobile Internet | Big data | Internet of Things | Automation of knowledge work | Cloud

Executive summary

The Association of Southeast Asian Nations (ASEAN) is a coalition that encompasses Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. At first glance, it appears to be an unlikely union of ten nations with a multitude of ethnicities, languages, and religions—not to mention starkly contrasting political systems and income levels. But Southeast Asia is tied together by multiple threads of history and culture as well as common geopolitical concerns. Today it is also increasingly linked by business networks, trade relationships, migration, and shared resources.

Now, almost five decades after the organization's founding, ASEAN is pursuing a more ambitious form of economic integration as a tool for achieving broader regional prosperity and greater global competitiveness. This aspiration is not yet a working reality on the ground, but there has been tangible progress in areas such as eliminating tariffs. If the region's leaders succeed in dismantling other types of barriers that hinder the movement of goods, services, capital, and skilled workers across its borders, ASEAN stands to reap the benefits of increased trade, production, and investment.

The region has experienced two decades of robust economic growth, which has successfully lifted millions out of poverty and created a middle class with newfound spending power. Consider the numbers: if ASEAN were a single country, it would already be the seventh-largest economy in the world (Exhibit E1). Its combined GDP of $2.4 trillion was more than 25 percent larger than India's economy in 2013. Home to more than 600 million people, it has a larger total population than the European Union or North America. ASEAN has the third-largest labor force in the world, behind only China and India, and its youthful

Exhibit E1

ASEAN has experienced rapid growth and relative stability since 2000

GDP 2013, current prices $ trillion		Real GDP growth, 2000–13 %		GDP growth volatility, 2000–13[1] %		Share of debt to GDP, 2013 %		Inflation rate, 2013 GDP deflator, %	
United States	16.8	China	10.0	Russia	4.2	Japan	243.2	India	7.0
China	9.3	India	7.0	India	2.4	Italy	132.5	Russia	6.5
Japan	4.9	**ASEAN**	**5.1**	United Kingdom	2.3	United States	104.5	Brazil	6.5
Germany	3.6	Russia	4.4	Italy	2.3	France	93.9	**ASEAN**	**2.8**
France	2.7	Brazil	3.2	Germany	2.3	United Kingdom	90.1	Germany	2.3
United Kingdom	2.5	Canada	1.9	Japan	2.2	Canada	89.1	United Kingdom	2.1
ASEAN	**2.4**	United States	1.8	Brazil	2.2	Germany	78.1	China	1.7
Brazil	2.2	United Kingdom	1.5	China	1.8	India	66.7	United States	1.5
Russia	2.1	Germany	1.1	United States	1.7	Brazil	66.3	Canada	1.5
Italy	2.1	France	1.0	Canada	1.7	**ASEAN**	**46.7**	Italy	1.4
India	1.9	Japan	0.8	France	1.6	China	22.4	France	1.1
Canada	1.8	Italy	0.0	**ASEAN**	**1.5**	Russia	13.4	Japan	-0.6

1 Standard deviation of GDP growth rate.
SOURCE: IHS; *World economic outlook,* International Monetary Fund, April 2014; McKinsey Global Institute analysis

population is producing a demographic dividend. The region proved remarkably resilient in the aftermath of the 2008 global financial crisis, and today gross government debt is less than 50 percent of GDP, far lower than the levels in many developed economies.

Despite its momentum, Southeast Asia faces some pitfalls on its current trajectory—and low productivity ranks chief among them. Although productivity has been rising in recent decades, much of this progress was driven by a broad shift of labor from agriculture into more efficient sectors, rather than improvements within sectors. Productivity remains at worryingly low levels in most Southeast Asian countries, which hampers their ability to continue to raise living standards. Unless the region builds a more competitive manufacturing sector, it could miss out on the opportunity to secure more production from multinational corporations. While demographics are still favorable, the boost to economic growth from an expanding workforce will eventually begin to taper. In fact, some of the region's countries will need to more than double their historic rates of productivity gains to sustain their pace of economic growth. Beyond its productivity imperative, Southeast Asia faces urgent priorities in addressing infrastructure, housing, and education. Existing gaps and shortfalls could constrain the region's potential without the right set of catalysts to propel growth in the decades ahead.

Southeast Asia can address many of these challenges by carving out its own unique opportunities from three global megatrends: the ongoing expansion of cross-border trade, unprecedented urbanization, and the advent of multiple disruptive technologies. These forces are already reshaping the region. But they are unlikely to lift it to the next level of economic development in the absence of an active strategy for capitalizing on them. If policy makers and businesses prioritize the opportunities associated with these trends and build a forward-looking growth agenda around them, however, the results could be transformative. While some of their effects could overlap, we calculate that each of these catalysts could boost annual GDP by hundreds of billions of dollars by 2030 (Exhibit E2).[1]

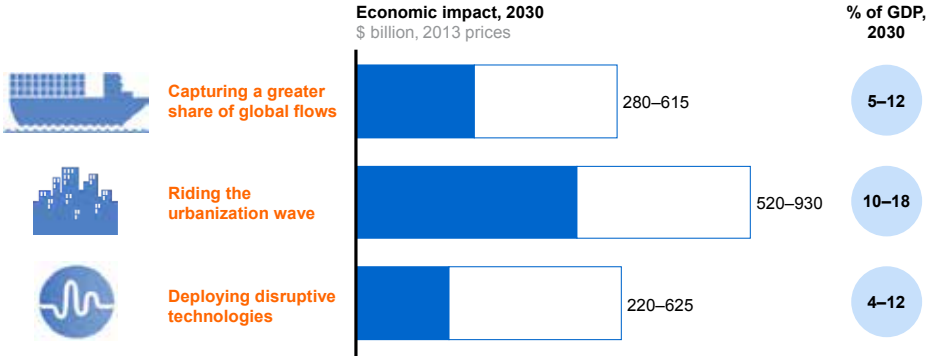
We chose to focus on these three trends after considering a broader set of ideas and evaluating each one for its potential impact in five areas: productivity, inclusiveness, resilience, agility, and connectivity, all of which are fundamental to creating sustainable and broad-based prosperity. In terms of productivity, for example, urbanization creates the critical mass and density necessary to produce economies of scale and network effects; a city with 200,000 people is 3 to 8 percent more productive on average than one with 100,000 residents.[2] Capturing these opportunities could also create more inclusive societies. The investment associated with developing the necessary trade and urban infrastructure alone could create tens of millions of jobs, while new technologies can deliver vital education and health services to more remote areas.

1 These projections are calculated on a total rather than an incremental basis to understand their full effect. This approach was also taken due to difficulty in establishing the baseline impact for each individual lever across ten economies. Each projection is based on dozens of interviews with regional experts and a combination of macroeconomic and industry projections. See the technical appendix for further details.

2 Stuart S. Rosenthal and William C. Strange, "Evidence on the nature and sources of agglomeration economies," in *Handbook of urban and regional economics*, 1st ed., volume 4, J. V. Henderson and J. F. Thisse, eds., Elsevier, 2004.

Exhibit E2

Three economic opportunities have the potential for substantial impact across ASEAN by 2030



NOTE: These figures are based on a partial-equilibrium analysis that estimates only first-order effects and therefore cannot be summed to calculate the full economic impact. Numbers are rounded to nearest $5 billion.
SOURCE: McKinsey Global Institute analysis

But these trends also pose risks. Deeper participation in international trade ushers in new competitive pressures, and while these are beneficial from a productivity standpoint, they could dislodge current industry leaders. Inequality could deepen as structural change from lower- to higher-productivity sectors accelerates, reducing demand for less-skilled workers. In addition, some of the sectors that are likely to experience rapid growth, such as trade and transport as well as construction, are often associated with vulnerable and informal employment. Technology-driven automation could eliminate some clerical functions or customer service jobs; workers in these roles will need to adapt and learn the skills to carry out higher-value tasks. And without careful urban planning and investment, cities could develop slums, gridlock, and overburdened public services that eventually choke off economic growth rather than enhancing it.

Given the size of the potential prize and the importance of managing the associated risks, these three forces need to move to the center of the region's policy discussions—and businesses need to embed them into their strategic planning. The countries and companies that move quickly to seize the opportunities could secure advantages that last for decades to come. The section below describes how Southeast Asia could harness each of these trends to address its current gaps, deepen the benefits of regional integration, and create new sources of growth for the future.

Capturing a greater share of global flows

In 2012, the flows of goods, services, and finance across the world's borders reached $26 trillion, or 36 percent of global GDP. That is 1.5 times as large relative to GDP as they were in 1990—and current flows could nearly triple by 2025. MGI research has shown that countries that are more connected within global networks of flows experience larger benefits in terms of GDP growth than countries that are less connected.[3] Southeast Asia has an opportunity to translate this global phenomenon into regional growth.

3 For further details, see *Global flows in a digital age*, McKinsey Global Institute, April 2014. Financial flows cover foreign direct investment, equity, bonds, and loans.

The MGI Connectedness Index sheds light on where each ASEAN country stands in terms of integration into the global economy. It assesses 131 nations, tracking their inflows and outflows of goods, services, finance, people, and data and communication, relative to the size of their economies. Singapore is far and away the region's standout on the index, ranking fourth globally. Four other ASEAN countries also place in the top 50: Malaysia (18), Thailand (36), the Philippines (45), and Vietnam (48). Given its proximity to India, China, and Japan, ASEAN is well positioned to benefit from all types of global flows—and by 2025, more than half of the world's "consuming class" will live within a five-hour flight of Myanmar.[4]

The biggest potential for Southeast Asia in the near term is capturing a larger share of the world's trade in goods and services. To date, exports have played a smaller role than consumption and investment in driving GDP growth in many ASEAN countries. However, two major developments are creating a unique window of opportunity to increase exports. First, the region's cross-border flows will deepen and accelerate if the ambitious ASEAN Economic Community (AEC) integration plan is successfully implemented. The AEC, which envisions the freer movement of goods, services, capital, and people among member states, is becoming a working reality and creating an open market of 600 million consumers. Second, as China's labor costs continue to rise, multinational companies will look for new production sites. This represents an opening for ASEAN member states to establish themselves as bigger hubs of manufacturing.

Together these opportunities could be worth $280 billion to $615 billion by 2030, which is equivalent to almost 12 percent of the region's projected GDP in that year.[5] This expansion of manufacturing and trade could provide a significant boost to employment and living standards. One study suggested that AEC integration could add 14 million jobs to six ASEAN economies (Cambodia, Indonesia, Laos, the Philippines, Thailand, and Vietnam) by 2025.[6]

Integration can accelerate the flow of trade and encourage companies to enter new markets. Removing many of the inefficiencies associated with exporting could lower the prices of goods and services as well as enabling retailers to stock a broader range of merchandise. This could spur new consumption across Southeast Asia, leading to a virtuous cycle of growth. In addition, improved logistics networks (in terms of both cost and efficiency) will speed time to market and allow companies to be more nimble in responding to new demand. Our analysis finds that greater integration could produce productivity benefits worth up to 20 percent of the cost base in many sectors. While it could intensify competition, creating new winners and losers across the region, it can unlock new demand and create substantial consumer surplus.

In 2007, ASEAN member states committed to accelerating AEC implementation with the goal of forming a single market and production base by 2015. A new MGI assessment measuring progress on the ground reveals that no sector

4 Defined as households with more than $7,500 in annual income (in 2005 purchasing power parity terms).

5 Based on estimates in the academic literature of the economic impact from ASEAN concluding bilateral free trade agreements with the United States, Europe, and other key Asia-Pacific countries in addition to AEC integration. See Peter A. Petri, Michael G. Plummer, and Fan Zhai, "The ASEAN Economic Community: A general equilibrium analysis," *Asian Economic Journal*, volume 26, number 2, June 2012.

6 *ASEAN Community 2015: Managing integration for better jobs and shared prosperity*, Asian Development Bank and the International Labour Organisation, August 2014.

today is fully integrated across all the dimensions that matter for cross-border operations. However, while full integration appears highly unlikely by the target date of 2015, there has been real progress. The most notable step forward has been the near elimination of tariffs. Average tariff rates in the original five member states (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) have been virtually zero since 2010. But other types of barriers are falling more slowly. MGI conducted a survey of regional businesses, and respondents cited restrictions on foreign investment and ownership as the biggest barriers to trade, followed by standards and regulations that vary between countries and inefficient customs procedures. Integration is proceeding faster for traded goods (particularly automotive, textiles, and wood) than for services (such as finance and health care).

Two factors seem to be important for creating momentum. First is the mindset of business leaders. In some sectors, integration is clearly perceived as a "win-win," and local stakeholders are not resisting change. The second is whether key companies in a given sector are willing to devote resources to working with governments to drive the process forward. In the cosmetics industry, for example, L'Oréal actively participated in four years of groundwork by the ASEAN Consultative Committee on Standards and Quality to produce a harmonized regulatory scheme that reduces technical barriers to trade. Governments play a fundamental role in setting the conditions that either enhance or constrain the flow of goods and services, and their engagement is crucial to removing legislative and regulatory barriers.

The transitions taking place in China—including rising labor costs and the shift toward an economic model that is less reliant on exports—are creating ripple effects in Southeast Asia. ASEAN has a window of opportunity to capture a greater share of global manufacturing, especially from multinationals that are seeking a lower cost base or are simply daunted by the challenges of doing business in China. The availability of low-cost labor in Cambodia, Indonesia, Laos, Myanmar, and Vietnam can be a competitive advantage. Average costs for factory labor are about $7 a day in Vietnam and $9 in Indonesia, far less than the $28 average in China (which has posted a 19 percent compound annual growth rate in wages since 2007).

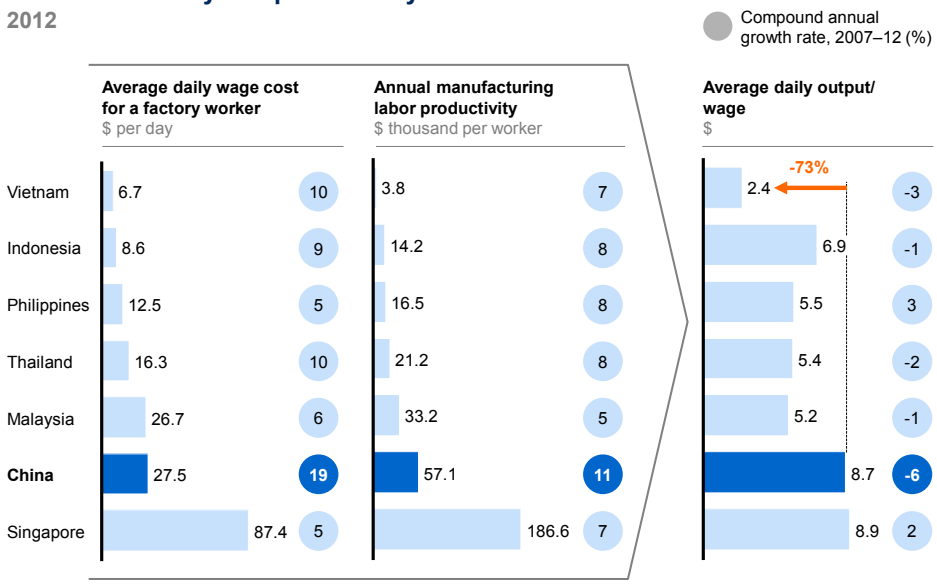
However, the advantage of low labor costs in these countries is undermined by weak output per worker. In 2012, average labor productivity in Vietnam's manufacturing sector was only about 7 percent of that in China (Exhibit E3). Southeast Asia's lower-income countries will have to grapple with their productivity challenges in order to lift the wages of factory workers in the future while remaining competitive.

Turning ASEAN into a unified powerhouse of manufacturing and trade will require both public and private efforts. On the policy side, the first step is increasing awareness of ASEAN and the AEC among the business community and the broader public alike. Focusing on removing a handful of key administrative barriers that are important to businesses could release significant value and go a long way toward illustrating the benefits of integration. The ASEAN Secretariat also needs additional resources to manage and monitor the integration process.

Exhibit E3

ASEAN's labor costs are lower than China's, but this competitive advantage is undermined by low productivity

2012



NOTE: Brunei, Cambodia, Laos, and Myanmar not included due to lack of available data. Analysis assumes Monday-Friday work and 4 weeks off work per year for all countries (combination of leave allowances and public holidays).

SOURCE: IHS; Statistics Indonesia; Bank of Thailand; Department of Statistics Malaysia; SingStat; Philippines Statistics Authority; General Statistics Office Vietnam; National Bureau of Statistics of China; Ministry of Human Resources Malaysia; McKinsey Global Institute analysis

If the region hopes to maximize the benefits of integration by expanding manufacturing, it will need to maintain macroeconomic and political stability, build world-class infrastructure, and intensify its focus on workforce skills. Becoming the location of choice for multinationals will involve creating the right set of incentives, improving the ease of doing business, loosening foreign investment restrictions, and establishing effective government agencies for marketing.

Small and medium-sized enterprises (SMEs) play an outsized role in the region's economy; ensuring that they have greater access to financing will position them to scale up. Our survey and interviews reveal that many companies have not incorporated integration or emerging trade deals into their strategies. But staking out a position early as markets start to open and fully utilizing existing trade frameworks can make all the difference in whether companies are able to turn integration into a growth opportunity.

As a regional grouping, ASEAN does not have the deep institutional ties and infrastructure links that bind together the European Union. Nor has it built the kind of seamless supply chains that funnel massive trade flows through North America. But the region does have strong momentum and enormous potential. If it can build the right underpinnings and make integration work on the ground, ASEAN could accelerate productivity growth by overcoming some of the fragmentation that has prevented companies, technologies, and services from achieving scale in the past.

Riding the urbanization wave

The rise of cities has gone hand in hand with strong economic growth in China, India, and elsewhere in the developing world, and similar forces are at work across Southeast Asia. Today just over one-third of the region's population lives in cities that account for two-thirds of the region's GDP. This expansion shows no sign of slowing: by 2030, we expect that these cities will attract more than an additional 90 million people and bring the urban share to almost 45 percent of the population and 76 percent of GDP. The economic and societal changes associated with this shift will reverberate for years to come. By 2030, the continued growth of cities could add $520 billion to $930 billion to the region's GDP.

Urbanization is a major driver of economic growth. In fact, no country has ever climbed from low-income to middle-income status without a significant population shift into cities. This reflects several factors, starting with the job mix effect. As people leave behind farms for urban jobs, they become more productive and earn higher wages. In Malaysia, for example, real GDP per capita at purchasing power parity grew 3.4 percent annually from 1990 to 2010 as the urban share of the population increased from 50 percent to 72 percent. Cities give businesses access to a broader base of customers, suppliers, and capital, and they are magnets for talent, including workers with greater levels of skills and education. Additionally, previous MGI research has found that it is up to 50 percent cheaper to deliver a number of basic services, such as piped water, to dense urban areas than to sparsely populated areas.[7]

Already some 81 million households in ASEAN states are part of the "consuming class," with incomes exceeding the level at which they can begin to make significant discretionary purchases.[8] As huge populations continue to move to cities for better job opportunities, that number could double to 163 million households by 2030. This dramatic income shift will spur demand for a wide range of goods and services.

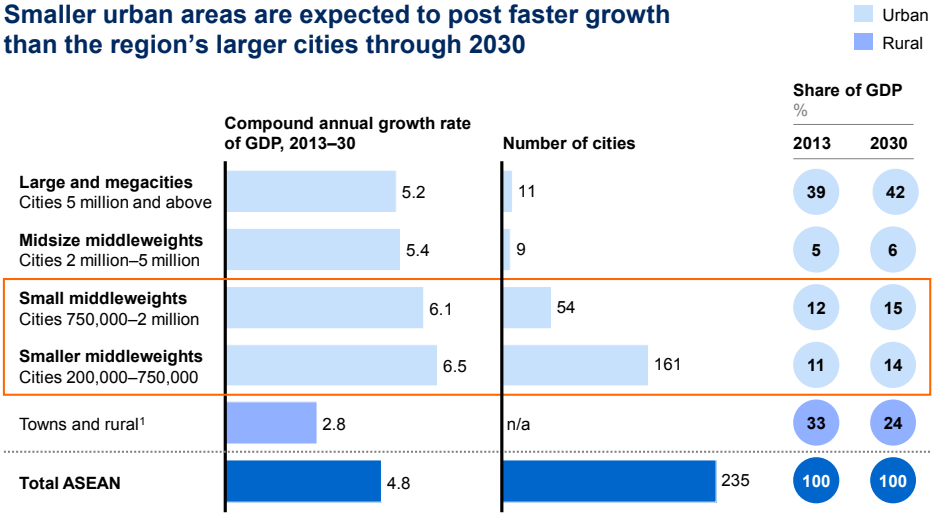
To capture this opportunity, consumer-facing companies need to craft strategies for navigating a fragmented wholesale and retail environment. New players will need to manage distributors effectively and take a city-level, rather than a national, view of markets—especially since many of the fastest-growing consumer markets are smaller up-and-coming cities (Exhibit E4). For example, we forecast that Cebu (in the Philippines) could be the fourth-largest market among ASEAN cities for detergent in 2030, Khon Kaen (in Thailand) could be the sixth-largest market for facial moisturizer, and Bekasi (in Indonesia) could be the sixth-largest market for diapers. Southeast Asia could be fertile ground for a wave of innovation—not only in consumer goods, but also in industrial goods and the services demanded by a more urban economy.

7 *Urban world: Cities and the rise of the consuming class*, McKinsey Global Institute, June 2012.

8 Defined as households with more than $7,500 in annual income (in 2005 purchasing power parity terms).

Exhibit E4

Smaller urban areas are expected to post faster growth than the region's larger cities through 2030



1 Includes cities with fewer than 200,000 inhabitants.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Global Institute Cityscope database; national statistics offices; McKinsey Global Institute analysis

Beyond the growth in consumption, this wave of urbanization calls for major infrastructure investment. Recent MGI research shows that with a few exceptions such as Japan, the value of infrastructure stock (excluding housing) in most economies averages around 70 percent of GDP.[9] But most of Southeast Asia falls well short of that level today. ASEAN member states will need to sharply increase their historical investment in order to reach and then maintain this benchmark of infrastructure stock to GDP as their economies grow. On top of building out the necessary water, power, sanitation, transportation, and communications systems, they will have to invest heavily in new housing and commercial space. Considering the region's infrastructure and real estate needs together brings the required cumulative investment to $7 trillion by 2030—an amount that is roughly double Germany's current GDP.

Undertaking this investment will be critical to determining whether cities develop in a livable and sustainable way. With multiple infrastructure needs competing for scarce resources, governments cannot afford the delays and spiraling costs that accompany too many large-scale projects. A relentless focus on making investment more productive could either reduce the capital that is required or deliver additional assets for the same amount spent. Past MGI research has found opportunities to reduce the cost of infrastructure by around 40 percent through better project selection, more efficient delivery, and strategies to maximize the life span and capacity of existing infrastructure. In addition, strong oversight and a robust financing framework are necessary to capture this savings.[10] Long-term urban planning will have to focus on resilient infrastructure to account for Southeast Asia's acute vulnerability to climate change.

Addressing infrastructure is only one aspect of planning and managing vibrant cities that can simultaneously deliver economic growth and a high quality of life. Another top priority for policy makers will be establishing affordable housing

9 *Infrastructure productivity: How to save $1 trillion a year*, McKinsey Global Institute, January 2013.

10 Ibid.

programs to absorb the expected wave of new urban migrants. Education and health-care services will need to be expanded so that inequality does not worsen. Eliminating corruption and improving governance is another ongoing challenge. Technology can provide effective new tools that help cities engage citizens, streamline service delivery, and manage complex infrastructure systems.

Deploying disruptive technologies

Much of ASEAN (with the notable exception of Singapore) is starting from a relatively low base in terms of digital infrastructure, adoption, and innovation. But this picture is beginning to change rapidly: from 2008 to 2013, the number of Internet users grew at a brisk 16 percent annually.[11] If the region can put the necessary backbone infrastructure in place, it could harness the power of technology to drive productivity improvements. Furthermore, ASEAN's starting point implies that it has a larger opportunity for technology-driven growth than more developed regions, with possibilities for digital leapfrogging in multiple areas. Most countries across the region have low penetration of landline phones and fixed-line broadband Internet, for instance, but they are bypassing these stages altogether in favor of the mobile Internet. In remote regions that have not built out traditional brick-and-mortar retail stores, shoppers may flock straight to e-commerce.

Five closely related digital technologies are poised to create substantial economic growth and societal change across multiple sectors and the entire region in the years ahead:

- **The mobile Internet.** The mobile Internet can pave the way for productivity gains and more efficient delivery of vital services. It is a particularly useful vehicle for overcoming Southeast Asia's geographical barriers and widening access to information, products, and services for rural populations. Mobile banking and mobile payments, for example, are expanding financial inclusion. Similarly, telemedicine can deliver health care to remote areas, and digital learning tools can improve the quality of education and teacher training across the region.

- **Big data.** The ability to analyze huge volumes of data, extract insights, and act on them in close to real time could be a source of advantage as Southeast Asia's newly prosperous middle class begins to flex its purchasing power. To better cater to consumers, companies will need to understand increasingly granular micro-segments of their markets. Big data analytics also offers financial institutions more sophisticated risk-management capabilities and allows the public sector to improve functions ranging from tax collection and procurement to disaster response. Sharing electronic medical records and analyzing patient data could lead to more effective administration of health-care services. Many ASEAN countries, however, are at a low starting point regarding data collection and usage. This underscores the substantial effort and commitment required for big data analytics to take flight, but it also highlights the large upside potential.

11 *World development indicators*, World Bank, 2014.

- **The Internet of Things.** The Internet of Things refers to networks of sensors and actuators embedded in machines and other physical objects that connect with one another and the Internet. Radio frequency identification (RFID) tags on containers and boxes, for example, can track products as they move through warehouses and transportation hubs to store shelves, allowing companies to tighten their supply chain to avoid stock-outs, excess inventory, and losses. GPS-enabled telematics can manage fleets and distribution networks in real time—a particularly important capability across Southeast Asia, where supply chains are highly fragmented. Similarly, smart storage and tracking systems in the agricultural supply chain can reduce food spoilage and waste by tracking container availability and temperatures. The Internet of Things can also monitor and manage complex infrastructure. Thailand's water authority, for example, is implementing a system to consolidate data across all of its regional water systems to track supply, losses, customer use, and water levels during flooding.

- **The automation of knowledge work.** Advances in artificial intelligence, machine learning, and natural user interfaces (such as voice recognition) are making it possible to automate many tasks long regarded as impossible or impractical for machines to perform. This breakthrough could have significant benefits for Southeast Asia given its localized shortages of skilled labor; it can go a long way toward filling in gaps or empowering workers with less training to achieve greater impact. Education systems, for example, can support overstretched teachers by employing algorithms that evaluate student performance and suggest specific points for greater classroom focus.

- **Cloud technology.** As the costs of cloud computing come down, companies across the region will gain pay-as-you-go access to secure storage and infrastructure services, basic software, and enterprise systems. Many small firms have limited access to IT services today, but cloud technology can give them new productivity tools without forcing them to tie up capital in IT systems that could quickly become obsolete. Advances in cloud computing will also reduce the costs associated with storing and analyzing big data. Singapore, for example, is creating the "H-Cloud," which will host all mission-critical systems for public hospitals, specialty centers, and polyclinics that are part of its Integrated Health Information Systems. This consolidation will save costs and pool information that could be analyzed to provide more efficient and effective patient treatment.

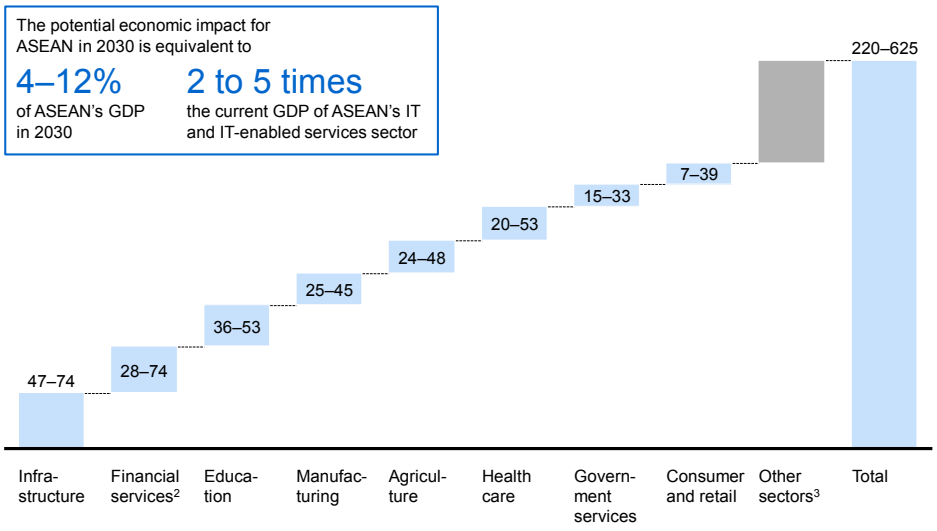
Together, these five disruptive technologies (along with several other sector-specific innovations such as 5D building information modeling to optimize infrastructure design, advanced genomics in agriculture and health care, and 3D printing in the consumer and retail sector) have the potential to unleash some $220 billion to $625 billion in annual economic impact by 2030. Within many sectors, there is large value at stake for companies that move quickly to digitize their operations and carve out competitive positions early. More broadly, these technologies can generate consumer surplus and enable governments to deliver public services more efficiently (Exhibit E5).

Exhibit E5

Disruptive technologies have significant potential across key sectors in ASEAN economies

Potential annual economic impact in ASEAN[1]

$ billion, 2030



1 These estimates do not represent GDP or market size (revenue), but rather economic potential, including consumer surplus. See the technical appendix for further explanation.
2 Includes $17 billion–$52 billion of sector-related impact from sector-related effects such as greater financial inclusion.
3 Additional sectors represent 25–30 percent of ASEAN's total GDP. Impact estimate based on top-down estimate of disruptive technologies.

SOURCE: McKinsey Global Institute analysis

Disruptive technologies could accelerate the region's growth and progress—and not just for its higher-income economies. The region's less developed countries have already displayed an enormous appetite for new technology: mobile penetration rates in Vietnam, Laos, and Cambodia went from less than 5 percent to more than 70 percent in less than a decade.[12]

To capture this opportunity, however, policy makers will need to prioritize building the backbone infrastructure (including fiber connections and mobile networks) that can provide universal and low-cost Internet access. As private players are unlikely to undertake the full scope of this build-out, governments will have to drive this effort forward; those that do could secure a deep and lasting advantage. Additional challenges include establishing a policy framework for data sharing, online privacy, and cybersecurity as well as supporting SMEs in technology adoption.

Technology is likely to cause some disruption in the labor market as supply chains and assembly lines are automated, e-commerce supplants traditional brick-and-mortar stores, and next-generation construction methods are adopted. In all, 6 to 8 percent of ASEAN's total non-farm labor force in 2030—or 12 million to 17 million workers in non-farm jobs—could be displaced by technology, and

12 *Myanmar's moment: Unique opportunities, major challenges*, McKinsey Global Institute, June 2013.

governments will have to ensure that they have access to support and retraining.[13] Education systems will need to emphasize the skills required in a more digital economy, focusing broadly on digital literacy and English proficiency while also cultivating enough deep analytical talent.

There is considerable overlap between the business agenda and the public policy agenda for technology adoption. Companies will need to work closely with governments on issues of skills, standards, and infrastructure. Large businesses and SMEs alike need to put management focus, time, effort, and capital into technology if they hope to stay ahead of the curve. One of their first challenges will be securing the right mix of skills and integrating their tech talent into all processes. In the longer term, they can develop talent by training existing employees or partnering with education providers. Businesses from all sectors will need to set up safeguards throughout their operations to protect customer data.

□ □ □

By focusing on global trade, urbanization, and disruptive technologies as drivers of future growth, Southeast Asia could be poised to make a leap forward in economic development. In all three of these areas, long-term thinking and investment by both the public and private sectors could create immediate economic impact while placing the region on a faster and more sustainable trajectory through 2030. If it is successful at harnessing these opportunities and transforming itself into a seamless regional market and production base, ASEAN could emerge alongside China and India as an economic powerhouse.

13 In addition to the five disruptive technologies profiled in this report, this analysis includes others that could have a significant impact on jobs due to productivity gains. For example, in construction, we also consider next-generation construction methods such as prefabrication. While we have not included the impact on farming jobs, technologies such as precision farming could also improve productivity in this sector.

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